Air Valve Truck-Stopping Device

For more information contact **Mark Strauch**
(925) 422-1469, strauch1@llnl.gov

The air valve truck-stopping device (AVTSD) has two main functional characteristics.

First, like the latest mechanical impact TSD units, the AVTSD requires two successive impacts before it is actuated and applies the service air brakes on a truck or trailer independent of any action by the driver of the vehicle.

Second, the AVTSD can be programmed such that a fixed period of time must transpire between the first and second impact before the AVTSD is activated to stop a vehicle. This adjustable time delay can be from zero to twenty seconds. Any second impact before the time delay has transpired will not activate the AVTSD.

Clearly, the AVTSD described above must have at least three operational states. These are 1) fully reset and ready for first impact; 2) impacted once and waiting for the time delay to pass so that a second impact will activate; and 3) impacted a second time after the time delay has passed. When the AVTSD is in the third state, it is activated and causes the service brakes on a vehicle to be applied. It is also desired that the AVTSD can be easily reset to the first state by those authorized to do so.

Project Goals

One of the milestones of this project was the demonstration and testing of an AVTSD.

FY2004 Accomplishments and Results

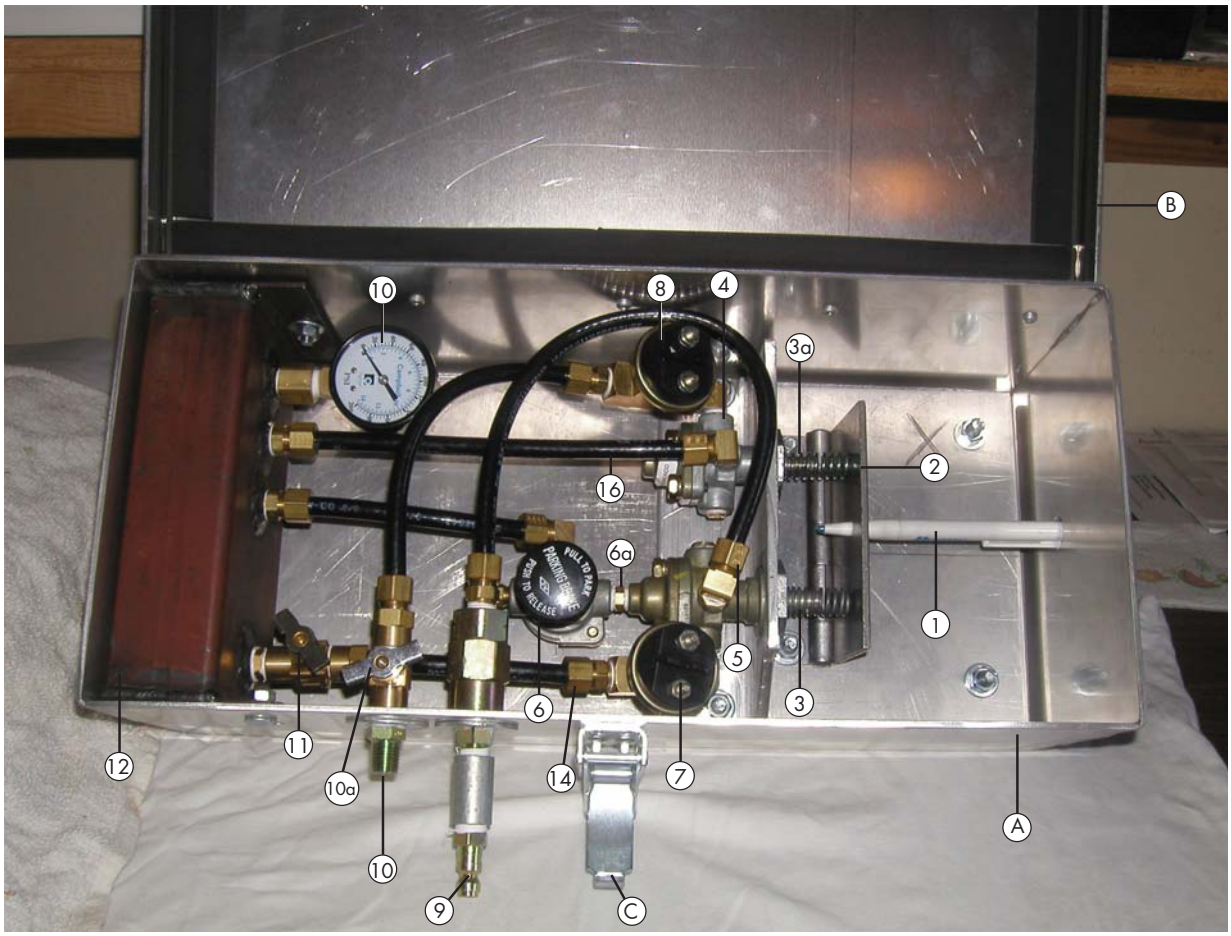
Our goal was achieved by a pneumatic system that behaves like a three-state electronic circuit with memory. The memory is contained in a small air tank that requires a specified time to charge up to a preset air pressure after the AVTSD unit has been impacted the first time. The air tank behaves like a capacitor in an electronic circuit. The logic elements in the system are accomplished using standard manually operated control air valves that have two stable states, ON and OFF.

Each of these control valves has an air input port, two air output ports, and an exhaust port. In the OFF state, no air pressure is passed from the input port to the output port(s). Any air pressure in the output port (line) is exhausted to ambient air pressure through the exhaust port that is co-linear with the activating plunger of the air valve. In the ON state, air pressure is passed from the input port to the output port and the exhaust port is disconnected from the output port.

The advantage of using these standard control valves is that these valves are mounted on millions of trucks and are, therefore, known to truck drivers.

The figure shows the AVTSD enclosure and its components. This AVTSD is constructed using only three Bendix air control valves, two model PP-1 valves and one model PP-8, plus a small air tank, and standard air hoses to connect the valves and the air tank. This assembly is contained in a locked aluminum enclosure, A, configured to be mounted under the chassis of any truck or trailer. Impact force on the rear bumper of a truck or trailer is transmitted to the AVTSD unit by a flexible control cable of any length.

Normally, the AVTSD enclosure is locked so that only authorized personnel can open the lid, B, and press the vertical PP-8 valve to reset the unit after it has been activated.



The AVTSD. The end of the mechanical control cable is the white shaft, 1, entering through a hole in the right end of the enclosure. This shaft pushes on the hinged plate, 2, which in turn pushes the plungers, 3 and 3a, of two air valves, 4 and 5, mounted in the horizontal position. Return springs are mounted on the air valve plungers so that the hinge plate returns to the OFF position whenever the impact force transmitted by the control cable is removed.

The operating cycle is as follows: a first impact on the hinged plate, 2, causes the PP-8 valve, 5, to be set in the ON position. Main supply air pressure, 9, then flows through valve 5 to build up air pressure in the air tank, 12. The setting of the adjustable valve, 11, determines the delay time before air pressure reaches the preset valve. Until air pressure in the tank exceeds the preset minimum level for the PP-1 valve, 4, the PP-1 valve will not stay in the ON position, no matter how many times it is depressed by additional impacts on the hinge plate. When the air pressure in the tank exceeds the preset minimum value, the next impact on the hinge plate will cause valve 4 to stay in the ON position and send air pressure to the air brake activation line, 10, thus activating the AVTSD.